AMENDMENTS TO THE CLAIMS

What is claimed is:

1. (Currently Amended) A method for operating a sensor network comprising a plurality of nodes, wherein the plurality of nodes comprises at least one sensor node~~, each sensor node~~ comprising at least one sensor, the method comprising:

organizing the plurality of nodes into a plurality of clusters by:

receiving an assembly packet from a first node at at least one node neighboring the first node, wherein the assembly packet includes a cluster indication and an instruction, wherein the instruction is either a become-base instruction or a become-remote instruction, and

in response to reception of the assembly packet at the at least one node,

[[if]] in response to the at least one node [[has]] having received a previous assembly packet, the at least one node ~~ignores~~ ignoring the assembly packet, and

[[if]] in response to the at least one node ~~has~~ not having received a previous assembly packet, the at least one node ~~(i) determines~~ determining a cluster for the node based on the cluster indication in the assembly packet, ~~(ii) modifies~~ modifying the assembly packet ~~to include a modified cluster indication~~, and ~~(iii) transmits~~ transmitting the modified assembly packet ~~with the modified cluster indication~~ to ~~each node~~ at least one neighboring ~~the~~ node, wherein modifying the assembly packet comprises:

modifying the assembly packet to include a modified cluster indication,

in response to the instruction being the become-base instruction, modifying the assembly packet to include the become-remote instruction, and

in response to the instruction being the become-remote instruction, modifying the assembly packet to include the become-base instruction;

collecting data using the at least one sensor node; and

distributing storage and processing of the collected data among the plurality of clusters comprising transferring data collected from the at least one sensor node to a node in a cluster other than a cluster comprising the at least one sensor node.

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2. (Previously Presented) The method of claim 1, wherein the first node is a sensor node.

3. (Previously Presented) The method of claim 1, further comprising automatically controlling data transfer, processing, and storage among the plurality of nodes based on the plurality of clusters.

4. (Previously Presented) The method of claim 1, further comprising supporting a plurality of levels of synchronization among different subsets of the plurality of nodes, wherein a first level of synchronization is supported among a first subset of the plurality of network elements, and wherein a second level of synchronization is supported among a second subset of the plurality of network elements.

5. (Currently Amended) The method of claim 1, further comprising controlling data processing using at least one processing hierarchy, the at least one processing hierarchy controlling at least one event selected from [[a]] the group consisting of data classifications, data transfers, data queuing, data combining, processing locations, and communications among the plurality of nodes.

6. (Previously Presented) The method of claim 1, further comprising:

surveying the sensor network at intervals for new nodes and missing nodes; and

responsive to finding a new node, permitting the new node to join into the sensor network based on a challenge and response session.

7. (Previously Presented) The method of claim 1, further comprising managing the plurality of nodes as a distributed and active database using a distributed resource management protocol, wherein the plurality of nodes are reused among different applications, and wherein the nodes are used in multiple classes of applications.

8. (Currently Amended) The method of claim 1, wherein the at least one function includes data acquisition, data processing, communication, data routing, data security, programming, [[and]] or node operation.

9. (Currently Amended) The method of claim 1, wherein the at least one sensor node comprises at least one preprocessor coupled among at least one state machine, at

least one application programming interface (API), [[and]] or at least one sensor.

10. (Currently Amended) The method of claim 1, wherein the plurality of nodes comprises a wireless-integrated-network-sensor next-generation (WINS NG) node comprising at least one preprocessor coupled to at least one processor and a plurality of application programming interfaces (APIs), wherein the plurality of APIs are configured to control at least one device selected from [[a]] the group consisting of sensors, actuators, communications devices, signal processors, information storage devices, node controllers, and power supply devices, and wherein the plurality of APIs support remote reprogramming and control of the at least one device.

11. (Original) The method of claim 10, further comprising layering the plurality of APIs.

12. (Previously Presented) The method of claim 10, further comprising:

enabling distributed resource management with the plurality of APIs by providing network resource information and message priority information to the plurality of nodes; and

controlling information transfer among the plurality of nodes using a synchronism hierarchy established in response to the resource information and message priority information.

13. (Currently Amended) The method of claim 10, wherein the at least one preprocessor performs at least one function selected from [[a]] the group consisting of data acquisition, alert functions, and controlling at least one operating state of the WINS NG node, and wherein the at least one processor performs at least one function selected from [[a]] the group consisting of signal identification, database management, adaptation, reconfiguration, and security.

14. (Previously Presented) The method of claim 1, further comprising controlling data processing, transmission, and storage among the plurality of nodes in response to a decision probability of a detected event.

15. (Currently Amended) The method of claim 1, further comprising performing at least one operation on the collected data in response to established parameters ~~established by a user~~, the at least one operation selected from [[a]] the group consisting of energy

detection, routing, processing, storing, and fusing.

16. (Currently Amended) The method of claim 15, wherein at least one of the routing, processing, storing, [[and]] or fusing are performed in response to at least one result of the energy detection.

17. (Currently Amended) The method of claim 15, wherein routing comprises selecting at least one data type for routing, selecting at least one of the plurality of nodes to which to route the selected data, selecting at least one route to the selected at least one of the plurality of nodes, [[and]] or routing the selected at least one data type to the selected at least one of the plurality of nodes.

18. (Currently Amended) The method of claim 15, wherein processing comprises selecting at least one data type for processing, selecting at least one processing type, selecting at least one of the plurality of nodes to perform the selected at least one processing type, [[and]] or transferring the selected at least one data type to the selected at least one of the plurality of nodes using at least one route through the sensor network.

19. (Original) The method of claim 18, wherein the selection of at least one processing type comprises determining at least one probability associated with a detected event and selecting at least one processing type in response to the at least one probability.

20. (Previously Presented) The method of claim 18, further comprising aggregating data processed in the plurality of nodes for further processing by other nodes.

21. (Currently Amended) The method of claim 18, further comprising aggregating data processed by the at least one sensor node for reporting ~~to the user~~.

22. (Currently Amended) The method of claim 15, wherein storing comprises selecting at least one data type for storage, selecting at least one storage type, selecting at least one of the plurality of nodes to perform the selected at least one storage type, [[and]] or transferring the selected at least one data type to the selected at least one of the plurality of nodes using at least one route through the sensor network.

23. (Previously Presented) The method of claim 15, wherein fusing comprises a

second node transmitting at least one query request to at least one other node, and wherein the second node collects data from the at least one other node in response to the at least one query request and processes the collected data.

24. (Currently Amended) The method of claim 1, further comprising supporting at least one communication mode among the plurality of nodes, wherein the at least one communication mode is selected from [[a]] the group consisting of wireless communications, wired communications, and hybrid wired and wireless communications.

25. (Currently Amended) The method of claim 1, further comprising coupling the at least one sensor node to at least one client computer using at least one of the plurality of nodes, wherein the plurality of nodes includes at least one gateway, at least one server, [[and]] or at least one network, and wherein the at least one network includes wired networks, wireless networks, [[and]] or hybrid wired and wireless networks.

26. (Currently Amended) The method of claim 25, wherein the at least one network comprises at least one network selected from [[a]] the group comprising the Internet, local area networks, wide area networks, metropolitan area networks, and information service stations.

27. (Currently Amended) The method of claim 26, further comprising internetworking among the plurality of nodes to provide remote accessibility using World Wide Web-based tools for data, code, management, [[and]] or security functions, wherein data includes signals, wherein code includes signal processing, decision support, [[and]] or database elements, and wherein management includes operation of the at least one node and the sensor network.

28. (Currently Amended) The method of claim 25, wherein the at least one gateway performs at least one function selected from [[a]] the group consisting of protocol translation, management of the plurality of network elements, management of remote communications ~~with at least one remote user~~, management of local communications ~~with at least one local user~~, and interfacing with at least one communication physical layer including wired local area networks, packet radio, microwave, optical, wireline telephony, cellular telephony, [[and]] or satellite telephony.

29. (Currently Amended) The method of claim 1, wherein the plurality of nodes further comprise at least one database, and wherein the at least one database includes at least one storage device selected from [[a]] the group consisting of storage devices coupled to at least one of the plurality of nodes and storage devices separate from the plurality of nodes.

30. (Original) The method of claim 29, further comprising providing non-local event correlation using cooperative sensing with information of the at least one database.

31. (Currently Amended) The method of claim 29, wherein the at least one database comprises data-driven alerting methods that recognize conditions on ~~user-defined~~ data relationships including coincidence in signal arrival, node power status, [[and]] or network communication status.

32. (Previously Presented) The method of claim 29, further comprising implementing the at least one database to use a declarative query language (DQL).

33. (Currently Amended) The method of claim 1, wherein the plurality of nodes includes sensing, processing, communications, [[and]] or storage devices supporting a plurality of processing and protocol layers.

34. (Previously Presented) The method of claim 1, further comprising establishing at least one redundant information pathway among the plurality of nodes.

35. (Previously Presented) The method of claim 1, wherein the plurality of nodes comprises a plurality of network element sets, and wherein the plurality of network element sets are layered.

36. (Previously Presented) The method of claim 1, wherein the plurality of nodes comprises a plurality of node types, wherein the plurality of node types includes at least one node of a first type and at least one node of a second type, wherein a first network having a first node density is assembled using the at least one node of a first type, wherein a second network having a second node density is assembled using the at least one node of a second type, and wherein the second network is overlaid onto the first network.

37. (Currently Amended) The method of claim 1, further comprising predistributing code and data anticipated for future use through the sensor network using low priority messages, wherein the code and the data are downloadable from at least one location selected from [[a]] the group consisting of storage devices of the plurality of nodes, and storage devices outside the sensor network.

38. (Currently Amended) The method of claim 1, further comprising transferring data using message packets, wherein the message packets are aggregated into compact forms in the at least one node using message aggregation protocols, wherein the message aggregation protocols are adaptive to at least one feature selected from [[a]] the group consisting of data type, node density, message priority, and available energy, wherein the message packets include decoy message packets, and wherein information to be transferred is impressed on random message packets to provide communication privacy.

39. (Currently Amended) The method of claim 1, wherein the at least one sensor is selected from [[a]] the group consisting of seismic, acoustic, infrared, thermal, force, vibration, pressure, humidity, current, voltage, magnetic, biological, chemical, acceleration, and visible light sensors.

40. (Previously Presented) The method of claim 1, wherein at least one of the plurality of nodes determines a position of at least one other of the plurality of nodes.

41. (Previously Presented) The method of claim 1, further comprising transferring software among the plurality of nodes, wherein the software transfer is remotely controllable.

42. (Previously Presented) The method of claim 1, further comprising protecting communications among the plurality of nodes using at least one public key security protocol.

43. (Previously Presented) The method of claim 1, further comprising determining at least one location of at least one of the plurality of nodes using location and time information of at least one Global Positioning System (GPS) device.

44. (Currently Amended) The method of claim 36, wherein the plurality of node types comprise at least one node type selected from [[a]] the group consisting of sensor nodes, gateway nodes, thin film substrate sensor nodes, tag nodes, conformal nodes, wired

nodes, wireless nodes, personnel nodes, equipment nodes, and vehicle internetwork nodes.

45. (Previously Presented) The method of claim 1, further comprising supporting short range and long range communications among the plurality of nodes.

46. (Currently Amended) A method of operating a sensor network, comprising:

organizing a plurality of network elements including a start node and at least one sensor node into a plurality of clusters by flooding an assembly packet from the start node ~~to each network element in the plurality of network elements~~, wherein flooding an assembly packet comprises:

receiving an assembly packet from a first network element at at least one network element neighboring the first network element, wherein the assembly packet includes a cluster indication and an instruction, wherein the instruction is either a become-base instruction or a become-remote instruction, and

in response to reception of the assembly packet at the at least one network element,

[[if]] in response to the at least one network element ~~has~~ having received a previous assembly packet, the at least one network element ~~ignores~~ ignoring the assembly packet, and

[[if]] in response to the at least one network element ~~has~~ not having received a previous assembly packet, the at least one network element: ~~(i) determines~~ determining a cluster for the network element based on the cluster indication in the assembly packet, ~~(ii) modifies~~ modifying the assembly packet ~~to include a modified cluster indication~~, and ~~(iii) transmits~~ transmitting the modified assembly packet ~~with the modified cluster indication~~ to ~~each~~ at least one ~~network element~~ neighboring ~~the~~ network element, wherein modifying the assembly packet comprises:

modifying the assembly packet to include a modified cluster indication,

in response to the instruction being the become-base instruction, modifying the assembly packet to include the become-remote instruction, and

in response to the instruction being the become-remote instruction, modifying the assembly packet to include the become-base instruction;

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collecting data from at least one sensor node; and

distributing processing of the collected data from the at least one sensor node to two or more nodes of the plurality of network elements that are in a same cluster as the at least one sensor node.

47. (Currently Amended) The method of claim 46, further comprising:

remotely programming and controlling at least one function of ~~the~~ a plurality of node types in response to the collected data via internetworking among the plurality of network elements; and

providing node information including node resource information and message priority from at least one node of a second type to the plurality of network elements, wherein the distributed processing of the collected data is in response to the node information.

48. (Currently Amended) A tangible computer readable medium having executable instructions stored therein, execution of which by a processing system causes the processing system to collect and process data in a sensor network by:

organizing a plurality of network elements including a start node and at least one sensor node into a plurality of clusters by flooding an assembly packet from the start node, ~~to each network element in the plurality of network elements~~ wherein the at least one sensor node includes at least one sensor, and wherein flooding an assembly packet comprises:

receiving an assembly packet from a first network element at at least one network element neighboring the first network element, wherein the assembly packet includes a cluster indication and an instruction, wherein the instruction is either a become-base instruction or a become-remote instruction, and

in response to reception of the assembly packet at the at least one network element,

[[if]] in response to the at least one node [[has]] having received a previous assembly packet, the at least one network element ~~ignores~~ ignoring the assembly packet, and

[[if]] in response to the at least one network element ~~has~~ not having received a previous assembly packet, the at least one network element ~~(i) determines~~ determining a cluster for the node based on the cluster indication in the assembly packet, ~~(ii) modifies~~ modifying the assembly packet ~~to include a modified cluster indication~~, and ~~(iii) transmits~~ transmitting the modified assembly packet ~~with the modified cluster indication~~ to ~~each node~~ at least one

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neighboring [[the]] node, wherein modifying the assembly packet comprises:

modifying the assembly packet to include a modified cluster indication,

in response to the instruction being the become-base instruction, modifying the assembly packet to include the become-remote instruction, and

in response to the instruction being the become-remote instruction, modifying the assembly packet to include the become-base instruction;

collecting data using the at least one sensor;

surveying the plurality of network elements for new nodes and missing nodes; and

distributing storage and processing of the collected data among the plurality of network elements, wherein distributing storage and processing of the collected data comprises transferring data from the at least one sensor node to two or more nodes of the plurality of network elements that are in a same cluster as the at least one sensor node and processing of the transferred data by the two or more local nodes.

49. (Canceled)

50. (Currently Amended) A tangible computer readable medium having executable instructions stored therein, execution of which by a processing system causes the processing system to collect and process data in a sensor network by:

organizing a plurality of network elements including a start node and at least one sensor node into a plurality of clusters by flooding an assembly packet from the start node ~~to each network element in the plurality of network elements~~, wherein flooding an assembly packet comprises:

receiving an assembly packet from a first network element at at least one network element neighboring the first network element, wherein the assembly packet includes a cluster indication and an instruction, wherein the instruction is either a become-base instruction or a become-remote instruction, and

in response to reception of the assembly packet at the at least one network element,

[[if]] in response to the at least one network element [[has]] having a previous assembly packet, the at least one network element ~~ignores~~ ignoring the assembly packet, and

[[if]] in response to the at least one network element ~~has~~ not having received a previous assembly packet, the at least one network element ~~(i) determines~~ determining a cluster for the network element based on the cluster indication in the assembly packet, ~~(ii) modifies~~ modifying the assembly packet ~~to include a modified cluster indication~~, and ~~(iii) transmits~~ transmitting the modified assembly packet ~~with the modified cluster indication~~ to ~~each~~ at least one ~~network element~~ neighboring ~~the~~ network element, wherein modifying the assembly packet comprises:

modifying the assembly packet to include a modified cluster indication,

in response to the instruction being the become-base instruction, modifying the assembly packet to include the become-remote instruction, and

in response to the instruction being the become-remote instruction, modifying the assembly packet to include the become-base instruction;

collecting data from using at least one sensor node; and

distributing processing of the collected data from the at least one sensor node to two or more nodes of the plurality of network elements that are in a same cluster as the at least one sensor node.

51. (Currently Amended) A tangible computer readable medium having executable instructions stored therein, execution of which by a processing system causes the processing system to collect and process data in a sensor network by:

organizing a plurality of network elements including a start node, one or more sensor nodes, and at least one ~~user~~ computer with at least one Internet coupling into a plurality of clusters by flooding an assembly packet from the start node ~~to each network element in the plurality of network elements, wherein each of the one or more sensor nodes is coupled to a sensor~~, wherein flooding an assembly packet comprises:

receiving an assembly packet from a first network element at at least one network element neighboring the first network element, wherein the assembly packet includes and an instruction, wherein the instruction is either a become-base instruction or a become-remote instruction, and

in response to reception of the assembly packet at the at least one network element,

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[[if]] in response to the at least one network element [[has]] having received a previous assembly packet, the at least one network element ~~ignores~~ ignoring the assembly packet, and

[[if]] in response to the at least one network element [[has]] not having received a previous assembly packet, the at least one network element ~~(i) determines~~ determining a cluster for the network element based on the cluster indication in the assembly packet, ~~(ii) modifies~~ modifying the assembly packet ~~to include a modified cluster indication~~, and ~~(iii) transmits~~ transmitting the modified assembly packet ~~with the modified cluster indication~~ to ~~each~~ at least one ~~network element~~ neighboring ~~the~~ network element, wherein modifying the assembly packet comprises:

modifying the assembly packet to include a modified cluster indication,

in response to the instruction being the become-base instruction, modifying the assembly packet to include the become-remote instruction, and

in response to the instruction being the become-remote instruction, modifying the assembly packet to include the become-base instruction;

collecting data via a sensor coupled to a sensor node of the one or more sensor nodes;

distributing processing of the collected data to two or more nodes in a same cluster as the sensor node of the plurality of network elements; and

controlling at least one function of the plurality of network elements in response to the collected data and node information via internetworking among the plurality of network elements.

52. (Currently Amended) The method of claim 1, wherein the data transferred ~~to the~~ to a node in a cluster other than a cluster comprising the at least one sensor node comprises: at least a portion of the collected data and/or processed data derived from the collected data.

53. (Currently Amended) The method of claim 1, wherein processing of the transferred data comprises one or more of ~~the following:~~ data combining, data transfer, [[and]] or fusing.

54. (Currently Amended) A method for operating a sensor network, comprising:

organizing a plurality of nodes, comprising a start node and one or more sensor nodes, into a plurality of clusters by flooding an assembly packet transmitted from the start node ~~to each other node in the plurality of nodes~~, wherein at least one sensor node of the one or more sensor nodes comprises a preprocessor and a processor, wherein the preprocessor is coupled to at least one sensor and is configured to cycle the processor into and out of a power-down state, wherein flooding an assembly packet comprises:

receiving an assembly packet from a first node at at least one node neighboring the first node, wherein the assembly packet includes a cluster indication and an instruction, wherein the instruction is either a become-base instruction or a become-remote instruction, and

in response to reception of the assembly packet at the at least one node,

[[if]] in response to the at least one node [[has]] having received a previous assembly packet, the at least one node ~~ignores~~ ignoring the assembly packet, and

[[if]] in response to the at least one node [[has]] not having received a previous assembly packet, the at least one node ~~(i) determines~~ determining a cluster for the network element based on the cluster indication in the assembly packet, ~~(ii) modifies~~ modifying the assembly packet ~~to include a modified cluster indication~~, and ~~(iii) transmits~~ transmitting the modified assembly packet ~~with the modified cluster indication~~ to ~~each node~~ at least one neighboring ~~the~~ node, wherein modifying the assembly packet comprises:

modifying the assembly packet to include a modified cluster indication,

in response to the instruction being the become-base instruction, modifying the assembly packet to include the become-remote instruction, and

in response to the instruction being the become-remote instruction, modifying the assembly packet to include the become-base instruction;

collecting data using the at least one sensor; and

distributing storage and processing of the collected data among the plurality of nodes, comprising transferring data from the at least one node to two or more local nodes of the plurality of nodes and processing of the transferred data by the two or more local nodes.

55. (Currently Amended) The method of claim 54, wherein distributing storage and processing of the collected data further comprises: selecting at least one data type for processing, selecting at least one processing type, selecting at least one of the plurality of nodes to perform the selected at least one processing type, [[and]] or transferring the selected at least one data type to the selected at least one plurality of nodes.

56. (Currently Amended) A method for operating a sensor network, comprising:

organizing a plurality of network elements into a plurality of clusters by flooding an assembly packet from a start node in the plurality of network element to each other network element in the plurality of network elements, wherein the plurality of network elements includes one or more sensor nodes, each sensor node comprising a sensor, wherein flooding an assembly packet comprises:

receiving an assembly packet from a first network element at at least one network element neighboring the first network element, wherein the assembly packet includes a cluster indication and an instruction, wherein the instruction is either a become-base instruction or a become-remote instruction, and

in response to reception of the assembly packet at the at least one network element,

[[if]] in response to the at least one network element [[has]] having received a previous assembly packet, the at least one network element ~~ignores~~ ignoring the assembly packet, and

[[if]] in response to the at least one network element [[has]] not having received a previous assembly packet, the at least one network element ~~(i) determines~~ determining a cluster for the network element based on the cluster indication in the assembly packet, ~~(ii) modifies~~ modifying the assembly packet ~~to include a modified cluster indication~~, and ~~(iii) transmits~~ transmitting the modified assembly packet ~~with the modified cluster indication~~ to ~~each~~ at least one ~~network element~~ neighboring ~~the~~ network element, wherein modifying the assembly packet comprises:

modifying the assembly packet to include a modified cluster indication,

in response to the instruction being the become-base instruction, modifying the assembly packet to include the become-remote instruction, and

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in response to the instruction being the become-remote instruction, modifying the assembly packet to include the become-base instruction;

collecting data via a sensor coupled to a sensor node of the one or more sensor nodes;

comparing the collected data to a threshold;

responsive to the collected data exceeding the threshold, communicating an indication of the event to a remote network element, wherein the remote network element is remote from the sensor node; and

distributing processing of the collected data among the plurality of clusters comprising transferring data from the sensor node to two or more nodes in a same cluster as the sensor node.